risk rating is determined for each agricultural field. Field data, such as soil texture, slope, P application rate, soil-test P, source of P being applied, type of crop, proximity to surface waters, and use of conservation practices, are used in the rating. From this information, each of the four loss pathways (soil-attached P erosion loss, soluble-P runoff loss, soluble-P leaching loss, and source-P loss) are calculated and added together to estimate the total P loss for a field. The final calculation is:

Total P Loss = Soil-attached P Erosion Loss + Soluble-P Runoff Loss + Soluble-P Leaching Loss + Source-P Loss

The data from this evaluation are summarized into categories called Index Values. The categories of low, medium, high, or very high classify the relative potential for P loss from the field. Table 3 describes the effect of PLAT rating on application of animal manure.

Note that a PLAT index value is not the same as a soil-test P index value. This is a source of confusion for site managers. Soil-test P index is a component of the PLAT rating, but the two values are not the same. It is possible to have a soil test with a high or very high P index and yet have a low or medium PLAT rating.

Because PLAT assesses each field based on several factors, it also can be used to determine if there are ways to lower the PLAT rating. For example, switching to a crop that reduces soil loss may affect the PLAT rating.

A PLAT assessment is not required for all agricultural fields that receive organic nutrient sources. Regulatory requirements vary by type of product (manure versus municipal biosolids versus industrial sludge) and by watershed. Regardless, a PLAT assessment can help a residuals application manager plan for more efficient application with less environmental risk from the potential loss of P.

Managing Phosphorus in Land Application

There are four main management techniques for dealing with P in land application programs:

1. Reduce the amount of P in the residuals.
2. Render the P in residuals less mobile by various treatment methods or chemical amendments.
3. Limit the amount of P applied to crop needs based on soil tests.
4. Crop and soil management

1. Reducing P in residuals

Studies and trials over the past few years with phytase have shown that increased P use efficiency can occur when phytase is added to hog and poultry feeds. For example, Pierce et al. (1997) reported that compared with pigs receiving a non-phytase diet, finishing pigs fed a diet supplemented with phytase had 30 to 40 percent lower P in the excreta. Use of low-phytate grain in feed can also increase P use efficiency, thereby decreasing P excretion (Klopfenstein et al., 2002). This study reports that feeding low-phytate corn reduced P excretion by up to 40 percent. Vadas (2004) has shown that adding phytase and decreasing P in diets reduced total P but increased soluble-P content in poultry manure compared to the normal diet. Managers should carefully review different research studies and results, and use the results in conjunction with a PLAT assessment, before modifying animal diets.

For biosolids, removal of source P is not practical as usually there are many input sources to a common collection facility. Also, as wastewater discharge limits for municipal and industrial sources become stricter for P, and wastewater treatment nutrient removal mechanisms become more efficient, more P is present in the residuals and biosolids.

Another method of reducing P from animal operations and municipal and industrial facilities is to prompt the formation of a crystalline product containing P commonly known as struvite (ammonium magnesium phosphate). Formation and collection of struvite allows for transport of the P material off site to be used as a fertilizer or animal feed ingredient. At present, this approach is not widespread, but is gaining in interest.

2. Rendering P less mobile from residuals

Some research supports that adding chemicals (such as alum) or making pH adjustments to residuals may

Table 3. PLAT Rating When Applying Animal Manure *

Rating	Index Value	Consequence of Rating
Low	0–25	Nitrogen-based manure application rate
Medium	26–50	Nitrogen-based manure application rate
High	51–100	Manure application rate is limited to P removal from the site in the harvested crop
Very High	>101	No additional P application is allowed

*These ratings apply in select situations for animal manure management in NC. These ratings are not directly relevant for other nutrient sources as of May 31, 2008.